

### ROUND 3

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#### TOSS-UP

1) MATH *Short Answer* What is the  $x$ -intercept of the graph with equation  $y = 7$ ?

ANSWER: THERE IS NONE

#### BONUS

1) MATH *Multiple Choice* If a line passes through point (1, 6) and has a slope of 4, which of the following is the equation of the line?

W)  $x = 2y + 4$

X)  $x = 4y + 2$

Y)  $y = 4x + 2$

Z)  $y = 2x + 4$

ANSWER: Y)  $y = 4x + 2$

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#### TOSS-UP

2) PHYSICAL SCIENCE *Multiple Choice* Which of the following does NOT correctly describe force in the context of a moving object?

W) It is a vector

X) It has a magnitude

Y) It is dependent on mass

Z) It is independent of acceleration

ANSWER: Z) IT IS INDEPENDENT OF ACCELERATION

#### BONUS

2) PHYSICAL SCIENCE *Short Answer* Identify the following three elements as a metal, metalloid and nonmetal, respectively: silicon, sodium, neon.

ANSWER: METAL = SODIUM; METALLOID = SILICON; NONMETAL = NEON

### TOSS-UP

3) GENERAL SCIENCE *Multiple Choice* All chordates **[KAWR-dayts]** possess which of the following?

- W) A notochord
- X) A spinal cord
- Y) Lungs
- Z) A four-chambered heart

ANSWER: W) A NOTOCHORD

### BONUS

3) GENERAL SCIENCE *Short Answer* Identify all of the following four parties who know which subjects are in which treatment groups in a double blind study involving human subjects: 1) the subjects, 2) the investigators who carry out the study, 3) the investigators who plan the study, 4) the statisticians who analyze the data.

ANSWER: 4 (ACCEPT: THE STATISTICIANS WHO ANALYZE THE DATA)

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### TOSS-UP

4) EARTH AND SPACE *Multiple Choice* Most gemstones belong to what class of minerals?

- W) Phosphates
- X) Oxides
- Y) Carbonates
- Z) Silicates

ANSWER: Z) SILICATES

### BONUS

4) EARTH AND SPACE *Multiple Choice* A supraglacial lake would be located at which of the following locations?

- W) Underneath a glacier
- X) On top of a glacier
- Y) In the moraine of a retreating glacier
- Z) At the glacier terminus

ANSWER: X) ON TOP OF A GLACIER

**TOSS-UP**

5) LIFE SCIENCE *Short Answer* What is the term for a heritable change in the character of a gene or a change in the sequence of base pairs in a DNA molecule?

ANSWER: MUTATION

**BONUS**

5) LIFE SCIENCE *Multiple Choice* Which of the following will most likely reduce genetic variation in a population?

- W) Disruptive selection
- X) Directional selection
- Y) Stabilizing selection
- Z) Genetic drift

ANSWER: Y) STABILIZING SELECTION

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**TOSS-UP**

6) ENERGY *Multiple Choice* A proton exchange membrane fuel cell exchanges which of the following ions?

- W) OH<sup>-</sup>
- X) Cl<sup>-</sup>
- Y) H<sup>+</sup>
- Z) Al

ANSWER: Y) H<sup>+</sup>

**BONUS**

6) ENERGY *Short Answer* What two states together account for approximately one fifth of the nation's nuclear power generation?

ANSWER: ILLINOIS AND PENNSYLVANIA

**TOSS-UP**

7) MATH *Short Answer* Providing your answer as a mixed number, what is  $1\frac{3}{4} + 2\frac{7}{8}$ ?

ANSWER:  $4\frac{5}{8}$

**BONUS**

7) MATH *Short Answer* For what value of  $k$  does  $kx + 7y = 10$  have a slope of 3?

ANSWER: -21

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**TOSS-UP**

8) PHYSICAL SCIENCE *Multiple Choice* Which of the following elements would be expected to have the most polar bond when bonded with oxygen?

- W) Sulfur
- X) Fluorine
- Y) Hydrogen
- Z) Nitrogen

ANSWER: Y) HYDROGEN

**BONUS**

8) PHYSICAL SCIENCE *Short Answer* Identify all of the following four choices that are electrically neutral: 1) gamma rays, 2) positrons, 3) alpha particles, 4) beta particles.

ANSWER: 1 (ACCEPT: GAMMA RAYS)

### TOSS-UP

9) GENERAL SCIENCE *Multiple Choice* Sharks and salmon have evolved different adaptations. Which of the following statements is true?

- W) Sharks lay eggs while salmon give birth to live young
- X) Sharks have cartilaginous [*kahr-tl-AJ-uh-nuhs*] skeletons while salmon have bony skeletons
- Y) Salmon possess gills while sharks do not
- Z) Sharks possess opercula while salmon do not

ANSWER: X) SHARKS HAVE CARTILAGINOUS SKELETONS WHILE SALMON HAVE BONY SKELETONS

### BONUS

9) GENERAL SCIENCE *Short Answer* What inner planet of our solar system is known for its clouds of sulfuric acid and sulfur dioxide?

ANSWER: VENUS

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### TOSS-UP

10) EARTH AND SPACE *Multiple Choice* Which of the following rocks has both high porosity and high permeability?

- W) Claystone
- X) Sandstone
- Y) Granite
- Z) Marble

ANSWER: X) SANDSTONE

### BONUS

10) EARTH AND SPACE *Short Answer* As a result of pressure, the melting point of glacial ice is known to decrease 0.7° Celsius per kilometer of depth. Providing your answer in kilometers to the nearest tenth, at what depth will a glacier begin to melt if it has a constant temperature of -2° Celsius?

ANSWER: 2.9

### TOSS-UP

11) LIFE SCIENCE *Multiple Choice* Angiosperms [*AN-jee-uh-spurms*] are plants that do what?

- W) Reproduce exclusively by spores
- X) Have flowers and fruits
- Y) Parasitize other plants
- Z) Produce seeds, but not flowers

ANSWER: X) HAVE FLOWERS AND FRUITS

### BONUS

11) LIFE SCIENCE *Short Answer* A student electrophoreses a sample of restriction-digested DNA. Upon staining, four distinct bands appear on the gel: A – 1500 base pairs, B – 2000 base pairs, C – 1000 base pairs, and D – 3000 base pairs. Based on the size of the restriction fragments, in what order do the bands appear on the gel, starting from the band closest to the well?

ANSWER: D, B, A, C

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### TOSS-UP

12) ENERGY *Short Answer* If 6 amperes of current flow through a 5 ohm resistor, what is the voltage across the resistor?

ANSWER: 30

### BONUS

12) ENERGY *Multiple Choice* Approximately how many days could a single person be fed from the corn needed to produce enough 100% ethanol to fuel a single SUV?

- W) 34
- X) 234
- Y) 365
- Z) 1089

ANSWER: Y) 365

### TOSS-UP

13) MATH *Short Answer* In the following proportion, solve for x over the real numbers:

$$\frac{(x-1)}{8} = \frac{6}{(x+1)}$$

ANSWER:  $\pm 7$

### BONUS

13) MATH *Short Answer* Dividing a certain number by 2 yields the same result as subtracting 15 from 3 times the number. Find the number.

ANSWER: 6

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### TOSS-UP

14) PHYSICAL SCIENCE *Multiple Choice* When a substance contains more of a dissolved compound than can be dissolved by the solvent under standard conditions, it is referred to as which of the following?

- W) Saturated
- X) Dissaturated
- Y) Over saturated
- Z) Super saturated

ANSWER: Z) SUPER SATURATED

### BONUS

14) PHYSICAL SCIENCE *Short Answer* In the balanced combustion reaction of one mole of propane with excess oxygen to form water and carbon dioxide, identify the number of moles, respectively, of carbon dioxide and water formed.

ANSWER: CARBON DIOXIDE = 3; WATER = 4

### TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* Lightning can NOT form between which of the following media?

- W) Cloud and air
- X) Air and ground
- Y) Cloud and cloud
- Z) Ground and cloud

ANSWER: X) AIR AND GROUND

### BONUS

15) GENERAL SCIENCE *Short Answer* Most organisms need nitrogen to create important compounds like amino acids and proteins, but cannot directly access nitrogen from the atmosphere. What is the name of the process that makes atmospheric nitrogen accessible to individuals in the food web?

ANSWER: NITROGEN FIXATION

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### TOSS-UP

16) EARTH AND SPACE *Multiple Choice* Which of the following types of volcano usually covers the most acreage on the surface of the Earth?

- W) Lava dome
- X) Cinder cone
- Y) Stratovolcano
- Z) Shield volcano

ANSWER: Z) SHIELD VOLCANO

### BONUS

16) EARTH AND SPACE *Multiple Choice* Black smokers are most likely to be found in association with what type of undersea geological site?

- W) Subduction zone
- X) Slip-strike fault
- Y) Methane seep
- Z) Spreading center

ANSWER: Z) SPREADING CENTER



### TOSS-UP

17) LIFE SCIENCE *Short Answer* What is the nitrogenous **[ny-TROJ-uh-nuhs]** base found in RNA that is NOT present in DNA?

ANSWER: URACIL

### BONUS

17) LIFE SCIENCE *Short Answer* What is the structural polysaccharide **[pol-ee-SAK-uh-ryd]** that forms the exoskeleton of arthropods **[AHR-thruh-pods]** and is the building material in the cell walls of some fungi?

ANSWER: CHITIN

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### TOSS-UP

18) GENERAL SCIENCE *Multiple Choice* Many fish possess a swim bladder filled with air for what purpose?

- W) Buoyancy
- X) Circulation
- Y) Digestion
- Z) Respiration

ANSWER: W) BUOYANCY

### BONUS

18) GENERAL SCIENCE *Multiple Choice* Which of the following pairs of countries is NOT located on the same tectonic plate?

- W) Great Britain and Russia
- X) China and India
- Y) Greenland and Mexico
- Z) Malaysia and Norway

ANSWER: X) CHINA AND INDIA

### TOSS-UP

19) MATH *Short Answer* What is the arithmetic mean of the numbers: -20, -12, 7, 9?

ANSWER: - 4

### BONUS

19) MATH *Short Answer* The measures of the angles of a triangle are in the ratio of 2:3:5. What is the measure in degrees of the triangle's largest angle?

ANSWER: 90°

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### TOSS-UP

20) PHYSICAL SCIENCE *Multiple Choice* A student is standing in an elevator that is moving. Taking upward to be positive and downward to be negative, which of the following could NOT be true?

- W) The student has a velocity equal to zero and a positive acceleration vector
- X) The student has an acceleration equal to zero and a positive velocity vector
- Y) The student has a positive acceleration vector and a negative velocity vector
- Z) The student has a negative acceleration vector and is slowing down

ANSWER: W) THE STUDENT HAS A VELOCITY EQUAL TO ZERO AND A POSITIVE ACCELERATION VECTOR

### BONUS

20) PHYSICAL SCIENCE *Short Answer* Electromagnetic radiation that has a wavelength of  $10^{-4}$  meters is in which region of the spectrum?

ANSWER: INFRARED (ACCEPT: INFRARED REGION, INFRARED BAND, IR, IR REGION, AND IR BAND)

### TOSS-UP

21) GENERAL SCIENCE *Multiple Choice* Arthropods [**AHR-thruh-pods**] evolved exoskeletons to better adapt to their environments. However, exoskeletons also present certain challenges. Which of the following statements does NOT describe a disadvantage associated with exoskeletons?

- W) Increased risk of desiccation
- X) Restricted sensory input
- Y) Restricted movement
- Z) Limited body size

ANSWER: W) INCREASED RISK OF DESICCATION

### BONUS

21) GENERAL SCIENCE *Short Answer* Many scientists believe viruses represent the boundary between the living and nonliving. They exhibit both similarities and differences when compared to living organisms. Identify all of the following four areas in which viruses are different from living organisms: 1) presence of genetic material, 2) reproduction, 3) evolution by natural selection, 4) metabolism.

ANSWER: 2, 4 (ACCEPT: REPRODUCTION, METABOLISM)

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### TOSS-UP

22) EARTH AND SPACE *Short Answer* Based on Iceland's location, what type of lava is most commonly seen erupting from Iceland's volcanic vents?

ANSWER: BASALT

### BONUS

22) EARTH AND SPACE *Short Answer* Place the following four geological time divisions in the correct order, from longest to shortest: 1) era, 2) epoch, 3) period, 4) eon.

ANSWER: 4, 1, 3, 2 (ACCEPT: EON, ERA, PERIOD, EPOCH)

**TOSS-UP**

23) LIFE SCIENCE *Short Answer* Shingles is a localized skin rash that is often very painful and is caused by reactivation of the virus that previously caused what common childhood disease in the host?

ANSWER: CHICKENPOX

**BONUS**

23) LIFE SCIENCE *Short Answer* There are three primary locomotor structures that aid in movement of single-celled organisms. One type of structure is flagella. Name one of the two other types.

ANSWER: CILIA (ACCEPT: CILIUM) OR PSEUDOPODIA (ACCEPT: PSEUDOPOD)

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**TOSS-UP**

24) ENERGY *Short Answer* Nuclear reactors rely on a nuclear chain reaction to cleave atoms and release energy at a controlled rate. What subatomic particle drives this chain reaction?

ANSWER: NEUTRON

**BONUS**

24) ENERGY *Short Answer* What is attributed with causing the universe to expand at an accelerating rate?

ANSWER: DARK ENERGY (DO NOT ACCEPT: DARK MATTER)

### TOSS-UP

25) LIFE SCIENCE *Short Answer* Several species of birds feed on ectoparasites **[ek-toh-PAR-uh-syts]** that they clean off of large mammals. Specifically, this behavior is what kind of interaction?

ANSWER: MUTUALISM (ACCEPT: FACULTATIVE MUTUALISM; DO NOT ACCEPT: SYMBIOSIS)

### BONUS

25) LIFE SCIENCE *Multiple Choice* Which of the following is an example of chemosynthesis?

- W) A Venus flytrap breaking down the phosphates in a fly
- X) A plant obtaining fixated nitrogen from bacteria rich soil
- Y) Prokaryotes **[proh-KAR-ee-ohs]** obtaining energy from sulfur compounds from the sea vents on the ocean floor
- Z) A human being breaking down vitamins and minerals for metabolic digestion

ANSWER: Y) PROKARYOTES OBTAINING ENERGY FROM SULFUR COMPOUNDS FROM THE SEA VENTS ON THE OCEAN FLOOR